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An Adaptive Partial Linearization Method for Optimization Problems on Product Sets

Igor Konnov[1]

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Abstract We consider a general class of composite optimization problems where the goal function is the sum of a smooth function and a non-necessary smooth convex separable function associated with some space partition, whereas the feasible set is a Cartesian product concordant to this partition. We suggest an adaptive version of the partial linearization method, which makes selective component-wise steps satisfying some descent condition and utilizes a sequence of control parameters. This technique is destined to reduce the computational expenses per iteration and maintain the basic convergence properties. We also establish its convergence rates and describe some examples of applications. Preliminary results of computations illustrate usefulness of the new method.

Keywords Composite optimization · Decomposable problems · Partial linearization method · Conditional gradient method · Tolerance control

Mathematics Subject Classification 90C30 · 90C06 · 65K05

1 Introduction

The conditional gradient method is one of the oldest smooth constrained optimization methods. It was first suggested in [1] for the case when the goal function is quadratic and the feasible set is polyhedral and further was developed by many authors, see, e.g., [2–6]. We recall that the main idea of this method consists in linearization of the goal

✉ Igor Konnov
konn-igor@yandex.ru

[1] Department of System Analysis and Information Technologies, Kazan Federal University, ul. Kremlevskaya, 18, Kazan, Russia 420008